

Batın Cerrahi Sonrası Radyolojik Bulgu Gösteren Akciğer Komplikasyonlarının Değerlendirilmesi

Evaluation of Pulmonary Complications with Radiological Findings following Abdominal Surgery

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ÖZ

GİRİŞ ve AMAÇ: Cerrahi girişimler ve uygulanan anestezi sonrasında meydana gelen patofizyolojik değişiklikler akciğer komplikasyonlarının gelişimini kolaylaştırmaktadır. Bu çalışmada batın cerrahisi sonrası radyolojik bulgu gösteren akciğer komplikasyonlarının değerlendirilmesi amaçlandı.

YÖNTEM ve GEREÇLER: Genel anestezi altında batın cerrahisi yapılan 619 hastadan istenen göğüs hastalıkları konsültasyonları retrospektif olarak incelendi. Radyolojik bulgu saptanan hastalar çalışmaya alındı.

BULGULAR: Postoperatif göğüs hastalıkları konsültasyonu istenen hastaların %20,7'sinde radyolojik bulgu tespit edildi. Hastaların yaş ortalaması 57.28±11.2 olarak saptandı. Değerlendirilen 128 hastanın, 81 (63.2%) üst batın, 47'ne (36.7%) alt batın cerrahisi yapılmıştı. Üst batın cerrahi yapılan hastaların 51'i (62.9%) 60 yaş üzerindedir. En sık akciğer komplikasyonları plevral efüzyon (32.8%), pnömoni (26.5%), ateletazi (17.9%) idi. Üst batın cerrahisinde ateletazi (69.5%) ve plevral efüzyon (66%) daha fazla iken alt batın cerrahisinde pnömoni (76%) daha sıkı.

TARTIŞMA ve SONUÇ: Plevral efüzyon, pnömoni ve ateletazi, batın cerrahisi sonrası radyolojik bulgu veren en yaygın akciğer komplikasyonlarıydı. Özellikle üst batın cerrahisi sonrası ateletazi ve plevral efüzyon, alt batın cerrahisi sonrası ise pnömoni daha sık görülmesine rağmen bu komplikasyonların gelişiminde risk faktörleri arasında önemli bir fark yoktu.

Anahtar Kelimeler: plevral efüzyon, pnömoni, ateletazi, abdominal cerrahi.

ABSTRACT

INTRODUCTION: Pathophysiological changes after surgical interventions and anesthesia facilitate the development of postoperative pulmonary complications (PPCs). The purpose of this study was evaluation of pulmonary complications showing radiological findings after abdominal surgery.

METHODS: This was a retrospective study of pulmonology consultations requested for 619 patients who had undergone abdominal surgery under general anesthesia between January 2010 and November 2014. We included only patients in whom there was radiological evidence of PPCs.

RESULTS: Radiological findings were detected in 128 (20.7%) of the patients whom postoperative chest diseases consultation was requested. The mean age of the patients was 57.28 ± 11.2 years. Of the 128 patients evaluated, 81 (63.2%) had undergone upper abdominal surgery, the remaining 47 (36.7%) having undergone lower abdominal surgery. Of the patients who had undergone upper abdominal surgery, 51 (62.9%) were ≥ 60 years of age. The most common PPCs were pleural effusion (in 32.8% of the cases), pneumonia (in 26.5%), and atelectasis (in 17.9%). Among the patients who had undergone upper abdominal surgery, the most common PPCs were atelectasis and pleural effusion (seen in 69.5% and 66.0%, respectively), pneumonia was the most common PPC among (seen in 76.0% of) those who had undergone lower abdominal surgery.

DISCUSSION AND CONCLUSION: Pleural effusion, pneumonia, and atelectasis were the most common PPCs for which there was radiological evidence. In particular, atelectasis and pleural effusion were the most common PPCs after upper abdominal surgery, whereas pneumonia was more common after lower abdominal surgery. However, none of the risk factors evaluated correlated significantly with any such complications.

Keywords: pleural effusion, pneumonia, atelectasis, abdomen/surger.

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INTRODUCTION

Postoperative pulmonary complications (PPCs) are associated with significant morbidity and mortality, as well as with longer hospital stays. The reported prevalence of PPCs is 6-79%, and PPCs are a major risk associated with surgical procedures. Pathophysiological changes occurring after surgical interventions performed under anesthesia facilitate the development of PPCs. The surgical site is a major determinant of the risk and type of postoperative complications. However, other factors, including obesity, advanced age, smoking, comorbid lung diseases, anesthesia duration, and the type of surgical procedure, also define PPCs (1), which can include atelectasis, pneumonia, bronchospasm, pulmonary thromboembolism, pleural effusion, prolonged postoperative hospitalization, and prolonged mechanical ventilation (2).

Radiological findings are not expected in all lung diseases. However, radiological anomalies that were not identified on previous X-rays are quite important for the recognition of postoperative respiratory system pathologies. The aim of this study was evaluation of pulmonary complications showing radiological findings after abdominal surgery

MATERIAL AND METHOD

We retrospectively evaluated the results of pulmonology consultations requested for 619 patients who had undergone abdominal surgery under general anesthesia, in various departments (general surgery; urology; and obstetrics and gynecology), between January 2010 and November 2014. Among those 619 patients, PPCs were detected in 128 (20.7%). Cases involving thoracic surgery or laparoscopic surgery were excluded, as were those in which there were preoperative radiological findings indicative of pulmonary alterations.

For all patients, we collected data related to age, gender, smoking history, body mass index, American Society of Anesthesiologists (ASA) physical status classification, comorbidities, history of lung disease, lung compliance, chest X-ray findings, and chest CT findings.

Obesity was defined as a body mass index of ≥ 30 kg/m². The physical status of each patient was classified as ASA I, ASA II, ASA III, ASA IV, or ASA V, in accordance with the ASA clinical classification system (3).

The radiological evaluation involved X-rays and CT scans of the chest, one or both of which were employed in order to diagnose atelectasis, pleural effusion, and pulmonary embolism. In patients with fever, leukocytosis, cough, or dyspnea, pneumonia was diagnosed by the radiological detection of infiltrates. Atelectasis, pleural effusion, and pneumonic infiltrates were either unilateral or bilateral.

RESULTS

Among the 619 abdominal surgery patients, PPCs were detected in 128 (20.7%). Demographic data are presented in Table 1. As can be seen, the mean age of the patients was 57.2 ± 11.2 years, and 68 (53.1%) of the 128 patients were female. The distribution of the cases according to ASA physical status classification was as follows: 20 patients (15.6%) were classified as ASA I; 76 (59.4%) were classified as ASA II; and 32 (25.0%) were classified as ASA III. As shown in Table 2, the most common reasons for requesting a pulmonology consultations were respiratory symptoms (in 57.0%) and radiological findings consistent with pulmonary changes (in 35.9%). Of the 128 patients evaluated, 27 (21.1%) had chronic obstructive pulmonary disease (COPD), 8 (6.3%) patients had cardiac failure, 16 (12.5%) had hypertension, and 7 (5.5%) patients had diabetes mellitus. Of the 27 patients with COPD, 4 (14.8%) developed pneumonia, 6 (22.2%) developed atelectasis, and 11 (40.7%) developed pleural effusion. In addition, cases have atelectasis with pleural fluid was detected in 4 (3.1%), 5 (3.9%) cases have pneumonia with pleural effusion was detected in 5 (3.9%), and pulmonary infiltration (with pulmonary edema and volume overload) was detected in 9 (7.0%).

Of the 128 patients evaluated, 81 (63.2%) had undergone upper abdominal surgery, the remaining 47 (36.7%) having undergone lower abdominal surgery. Among the patients who had undergone upper abdominal surgery, the most common PPCs were atelectasis and pleural effusion (seen in 69.5% and 66.0%, respectively), whereas pneumonia was the most common PPC among (seen in 76.0% of) those who had undergone lower abdominal surgery. However, as can be seen in Table 3, the occurrence of the major PPCs (pleural effusion, pneumonia, and atelectasis) did not correlate significantly with

patient age, gender, body mass index, presence of comorbidities, smoking status, or ASA physical

status classification ($p > 0.05$ for all).

Table 1. Characteristics of the Patients Evaluated

Characteristic	Total	Upper abdominal	Lower abdominal
	(N= 128)	(n= 81)	(n= 47)
Age, n (%)			
≥ 60 years	69 (53.9)	51 (62.9)	18 (38.2)
< 60 years	59 (46.0)	30 (37.0)	29 (61.7)
Gender, n (%)			
Female	68 (53.1)	48 (59.2)	20 (42.5)
Male	60 (46.8)	33 (40.7)	27 (57.4)
Smoking in the last 8 weeks, n (%)	43 (33.5)	32(39.5)	11 (13.5)
Body mass index, n (%)			
≥ 30 kg/m ²	29 (22.6)	18 (22.2)	11 (23.4)
< 30 kg/m ²	99 (77.3)	63 (77.7)	36 (76.5)
ASA physical status classification, n (%)			
I	20 (15.6)	7 (8.6)	13 (27.6)
II	76 (59.3)	49 (60.4)	27 (57.4)
III	32 (25.0)	25 (30.8)	7 (14.8)
Comorbidities, n (%)			
HT	16 (12.5)	10 (12.3)	6 (12.7)
DM	7 (5.4)	6 (7.4)	1 (2.1)
CHF	8 (6.2)	6 (7.4)	2 (4.2)
COPD	27 (21.0)	22 (27.1)	5 (10.6)
Preoperative pulmonary symptoms, n (%)			
Cough	30 (23.4)	22 (27.1)	8 (17.0)
Dyspnea	29 (22.6)	23 (28.3)	6 (12.7)

ASA: American Society of Anesthesiologists; HT: hypertension; DM: diabetes mellitus; CHF: congestive heart failure; COPD: chronic obstructive pulmonary disease.

Table 2. Reasons for Requesting a Postoperative Pulmonology Consultation

Reason	N= 128
	n (%)
Respiratory symptoms	73 (57.0)
Radiological findings	46 (35.9)
Physical examination findings	5 (3.9)
Hypoxemia	4 (3.0)

Table 3. Features of Pleural Effusion, Pneumonia, and Atelectasis

Characteristic	Pneumonia	Atelectasis	Pleural effusion	p
	(n= 34)	(n= 23)	(n= 42)	
Age, n (%)				
≥ 60 years	15 (44.0)	15 (65.0)	18 (42.8)	0.161
< 60 years	19 (55.8)	8 (34.7)	24 (57.1)	
Gender, n (%)				
Female	16 (47.0)	13 (56.5)	24 (57.1)	0.653
Male	18 (52.9)	10 (43.4)	18 (42.8)	
Smoking in the last 8 weeks, n (%)	9 (26.4)	7 (30.4)	16 (38.0)	0.337
Body mass index, n (%)				
≥ 30 kg/m ²	8 (23.5)	5 (21.7)	6 (14.2)	0.959
< 30 kg/m ²	26 (76.4)	18 (78)	36 (85.7)	
ASA physical status classification, n (%)				
I	6 (17.6)	7 (30.4)	7 (16.6)	0.373
II	21 (61.7)	12 (52.1)	28 (66.6)	
III	7 (20.5)	4 (17.3)	7 (16.6)	
Comorbidities, n (%)				
HT	5 (14.7)	3 (13.0)	6 (14.2)	0.966
DM	1 (2.9)	3 (13.0)	1 (2.3)	
CHF	1 (2.9)	2 (8.6)	4 (9.5)	
COPD	4 (11.7)	6 (26.0)	11 (26.1)	0.154
Preoperative pulmonary symptoms, n (%)				
Cough	11 (32.3)	9 (39.1)	5 (11.9)	0.097
Dyspnea	3 (8.8)	9 (39)	11 (26)	0.024
Surgical site				
Lower abdominal	26 (76.4)	7 (30.4)	14 (33.3)	0.822
Upper abdominal	8 (23.5)	16 (69.5)	28 (66.6)	
Localization of radiological change				
Right	21 (61.7)	6 (26.0)	13 (30.9)	0.000
Left	10 (29.4)	12 (52.1)	7 (16.6)	
Bilateral	3 (8.8)	5 (21.7)	22 (52.3)	
Time to postoperative complication				
> 3 days	13 (38.2)	11 (47.8)	14 (33.3)	0.643
≥ 3 days	21 (61.7)	12 (52.1)	28 (66.6)	

ASA: American Society of Anesthesiologists; HT: hypertension; DM: diabetes mellitus; CHF: congestive heart failure; COPD: chronic obstructive pulmonary disease.

DISCUSSION

In the present study, the overall incidence of PPCs following abdominal surgery was approximately 20%. However, estimates in the literature vary widely, ranging from 20% to 69% (4,5). That variability is due primarily to the type of PPCs studied, the clinical criteria used in their description, and differences among the populations of surgical patients evaluated.

Postoperative radiological findings prompt requests for pulmonology consultations. In another study, radiological evidence of a PPC was the reason for requesting a pulmonology consultation in 17.7% of the cases evaluated (6). In our study, in 20,7% of the pulmonology consultation cases were detected to have radiological findings.

Pneumonia is a major cause of postoperative morbidity and mortality (7-9). According to data in the literature, the incidence of pneumonia in adults undergoing general surgery ranges from 18% to

68% (10-12). The incidence of pneumonia in patients ≥ 65 years of age who undergo general surgery has been reported to be 56% (13). In the present study, the incidence of pneumonia was 26.5%. Possible causes of postoperative pneumonia include colonization by microorganisms in areas of secretion retention and unresolved atelectasis or invasion of the lungs by pathogenic microorganisms through aspiration. Any aspirated content will affect the right middle or lower lung lobes, due to the anatomy of the bronchi. Therefore, patients who require prolonged respiratory support or have trouble expectorating tracheobronchial secretions are at risk (14). Postoperative pneumonia should be suspected in the presence of fever, leukocytosis, and new pulmonary infiltrates on chest X-rays (15).

Postoperative atelectasis is usually caused by decreased lung compliance, impaired regional ventilation, diaphragmatic dysfunction retention of airway secretions, or postoperative pain that interferes with spontaneous deep breathing and coughing (16). Diaphragmatic dysfunction after abdominal or thoracic surgery may be due to a reflex inhibition of the phrenic nerve output caused by sympathetic, vagal, or splanchnic abdominal receptor stimulation. The dysfunction may be unilateral or bilateral but usually originates on the left. In our study atelectasis was more common in left lung. In a study evaluating patients who had undergone major non-thoracic surgery, atelectasis (seen in 13.7%) was the most common PPC (17). In our study, atelectasis was detected in 23 (17.8%) of the 128 patients evaluated. Of those 23 patients, 15 (65.0%) were ≥ 60 years of age and 16 (69.5%) had undergone upper abdominal surgery.

In the literature, many different evaluations are made about the frequency and cause of pleural effusion (18-20). Nielsen et al. reported the prevalence of PPE as 69.5% in their prospective study in which they evaluated 128 cases (18). In other studies, results varying between 1-59% are given (19,20). In our study, pleural effusion was detected in 42 (32.8%) of the 128 patients. While pulmonary causes cause unilateral pleural effusion, extrapulmonary causes cause bilateral pleural effusions. The pleural effusion occurring due to surgical manipulation, which disappeared within a few days. In our study, bilateral pleural effusions were observed more frequently. The occurrence of pulmonary edema was due to transfusion-related

acute lung injury or overzealous fluid administration causing increased permeability across the alveolar-capillary membrane. The edema resolved spontaneously within a short period of time with no long-term sequelae. The same PPCs have been reported in a few other studies (21,22). In our study, pleural effusion was the most common PPC.

There are certain risk factors for the development of PPCs following abdominal surgery. According to the literature, the risk factors for PPCs are advanced age, obesity, smoking, ASA physical status classification \geq II, COPD, upper abdominal surgery, thoracic surgery, prolonged surgical time, prolonged anesthesia time, and the use of general anesthesia with a long-acting muscle relaxant(23-25).

Decreased immunity, lung restriction due to age-related kyphosis, and impaired pulmonary function are known risk factors for the development of PPCs (26-29). However, there are studies showing that advanced age alone is not a risk factor (30). In the present study, patients under 60 years of age accounted for 65% of the cases of atelectasis, 55.8% of the cases of pneumonia, and 57% of the cases of pleural effusion.

The ASA classification is used for the evaluation of patient physical status. Although it is a general classification, many studies have shown it to be related to PPC development (31-34). In our study, patients classified as ASA II accounted for 21 of the cases of pneumonia, 12 of the cases of atelectasis, and 28 of the cases of pleural effusion.

In our study, there were no significant differences among pleural effusion, pneumonia, and atelectasis in relation to patient age, gender, body mass index, the rate of comorbidity, smoking status, and ASA physical status classification ($p > 0.05$ for all).

Certain surgical sites are major risk factors for PPC development. Respiratory muscle function is affected during and after abdominal surgery (35-37), especially when the surgery is in the upper abdomen, either from manipulation or from surgical incision of the abdominal muscle groups. In lower abdominal surgery, respiratory muscle dysfunction is less frequently observed (approximately 2-5%), whereas respiratory muscle dysfunction affects 20-40% of patients who have undergone upper abdominal surgery (35,37). Anesthesia and pain also significantly contribute to respiratory muscle

dysfunction (35,36). The risk of PPCs decreases with the distance from the incision in relation to the diaphragm (38,39). However, de Cleve et al. demonstrated that upper and lower abdominal surgery both lead to substantial reductions in lung volume (40).

CONCLUSION

Pleural effusion, pneumonia, and atelectasis were the most common PPCs for which there was radiological evidence. In particular, atelectasis and pleural effusion were the most common PPCs after upper abdominal surgery, whereas pneumonia was more common after lower abdominal surgery. However, none of the risk factors evaluated correlated significantly with any such complications.

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